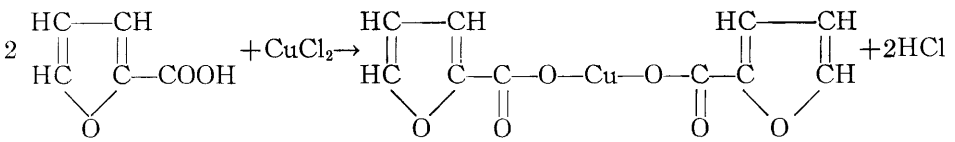
FORMATION OF CUPRIC FUROATE CRYSTALS IN SILICA GELS.[1]—Sizable (to 1 cm) crystals have been grown in silica gels made by mixing aqueous sodium-silicate solutions with water-ethanol solutions of furoic acid, and reacted, when set, with a small excess of cupric chloride. Philadelphia Quartz Company's "E" and "N" sodium silicates were used, each diluted with water to an alkalinity of 60 milliequivalents of OH^- per 100 ml of solution. One volume of either silicate solution added to one volume of 1 N 2-furoic acid solution constituted the gel-forming mixture. A 70:30 = water:ethanol mixture was used to prepare the solution of the acid. After the gels had set (several days to one week), a solution of cupric chloride containing an initial excess of 15 to 25 percent Cu^{2+} based on furoate ions was placed on the gel.

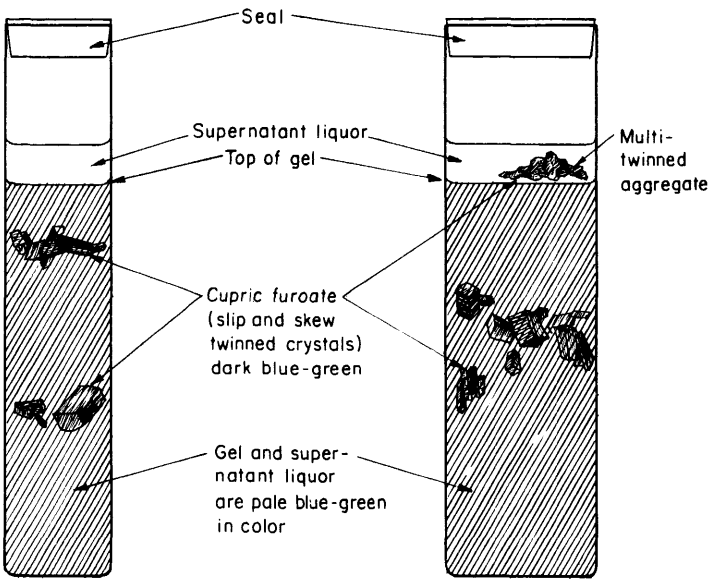
The reaction is as follows:



dark blue-green prisms

Beilstein (1934 XVIII 272) describes cupric furoate as $Cu(C_5H_3O_3)_2 . 3H_2O$, green crystals, more soluble in hot than in cold water. Presumably the crystals formed by reaction in gels are hydrated, as ample water is present.

The crystal formations which grew in the gels, and the volumes and concentrations of the gel-forming reactants and of the $CuCl_2$ used, are shown in Figure 1.



Silicate	E	N
Initial milliequivalents:		
H Furoic	10	25
OH^-	6	15
$CuCl_2$	12	28
Gel volume, ml	20	50

FIGURE 1. Formations of cupric furoate grown in silica gels.

[1]Manuscript received October 11, 1968.

All of the crystals appear to be twinned—either as parallel or as skew twins. Most of them are slightly veiled also, but one of the skew twins has two essentially clear "branches", which grew slowly as equilibration between gel and supernatant was nearing completion. The crystals are apparently monoclinic.

Further work is needed on the Cu^{2+}-furoate ion system to produce single crystals and to grow substantially larger ones than those achieved in the exploratory experiments described herein. This should include the use of other cupric salts than the chloride, varying the pH of the gel system, and ascertaining the influence of indifferent cations and anions placed deliberately in the gel or in the supernatant. As far as is known, cupric furoate crystals have not been characterized crystallographically, nor have their optical properties been investigated. Both of these aspects are areas for future research.—PHILIP F. KURZ, *Battelle Memorial Institute, Columbus Laboratories, Columbus, Ohio 43201.*